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BACKGROUND OF MIXED-install the mixer-distributor

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This article provides an analysis of the multi-mixer distributor and reasonably efficient establishment of working groups involved in the preparation of feed components for feeding.

Mixer-distributor, kormopryhotuvannya than, cutting energy costs.

Problem. Reducing the cost of livestock production is achieved by implementing scientifically based principles as the entire production cycle, and some of its elements, including mechanization, which must comply with the system "man-machine-animal".

Analysis of recent research. In cattle farms, with a developed dairy and meat direction in recent years have increasingly using multi-mixer distributor. Machines of this type are easy to operate and under certain conditions, provide quality indicators feed mixture. One of the main requirements, which impose to mechanization involved in the preparation of the feed mixture is resursozatrat reduction (energy, labor, material) [1, 4].

Further development of livestock needs improving technical facilities for the preparation of feed components for feeding [1, 2].

Preparation of feedstuffs in multi-mixer distributor must take place in a short period zootechnical, to ensure minimal loss of nutrient pollution and components, and to bring uniformity to the mixing of feed value> 85%. [3, 6].

The purpose of research - Justify the blades as the main working bodies involved in the grinding of feed materials and provide thus reducing energy costs.

Research results The main objective is to ensure that animals kormopryhotuvannya quality forage mixture with minimal energy and other costs.

Now in all countries with developed cattle farms dairy and meat direction of management for the preparation and distribution of feed used multi-mixer distributor.

During feeding animals such multifunction machine performs the following operations: intake of storage and stem succulent fodder; upload a hopper distributor roughage (including in rolls), green or canned food (hay and silage), roots; animal feed concentrates while weighing the

loaded portion of each component; crushing and stem succulent fodder; mixing feed components; transporting feed mixture to production facilities; issuance of a feed hopper stationary distributor or perform direct distribution of food in the feeding of animals.

Mixer-based distributor of the original feed materials can operate in crushing or dopodribnennya. Shredding feed all multi-chopper-mixers, both horizontal and vertical placement of screws engaged in working bodies (knives of different design). Installed with a certain angle to the axis of the screw or to the bottom of the machine.

With cutting theory known [6] that in the process of grinding, for example in drum apparatus should be eliminated friction feed material on the surface of the blade as a result of reduced energy costs for preparation of feed components.

Eliminating friction layer of the processed material on the knife, a cutting process in the multi-mixer distributor impossible for the complexity of the process and design features. 1.

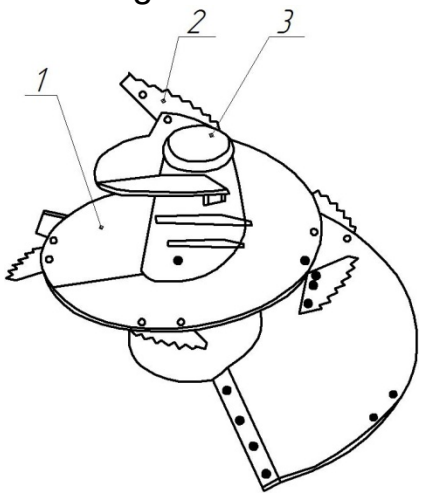

Fig. 1. the blades on the auger 1 - screw, 2 - a knife, 3 - the screw shaft.

The blades at an angle to the horizon equal to the angle of elevation spiral screw Fig. 1, leads to increased interaction with the surface of the blade feed, that is an additional friction feed to the outer surface of the knife Fig. 2.

a b

Fig. 2. Places wear knives: a - knives Cutter-Mixer with horizontal placement of the screw, b - Cutter-Mixer than the vertical placement of the screw and adjustable angle of attack, - knives Cutter-Mixer with vertical screw placement.

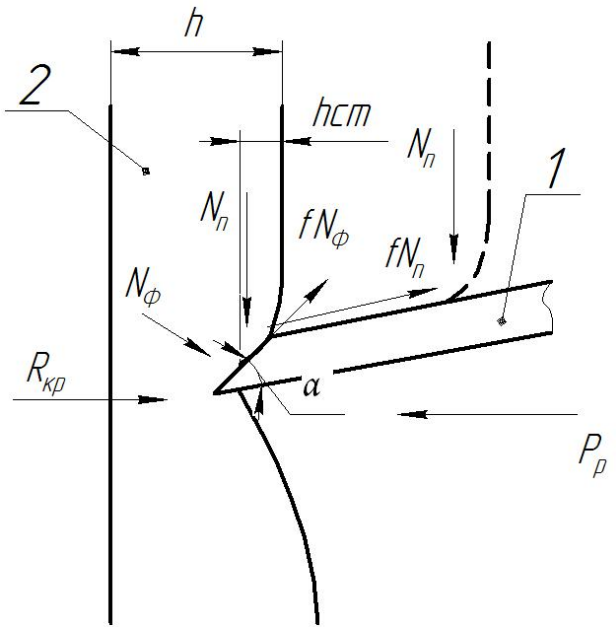

Fig. 3. Determination of cutting force 1 - knife; 2 - processed material.

First, consider the very essence of workflow cutting edge material. The process of cutting knife of the material Fig. 3 consists of the previous compression and separation of the particles. The action of the blade with the power Pp, able to cut the material is determined by the equation:

$$P_p = R_{кр} + fN_n + fN_ф \cos\alpha\,, \qquad (1)$$

where Rkr - critical material resistance to cutting, N; fNp - the friction caused by pressure Nn material on the surface of the knife, N; fNf - the friction caused by pressure Nf material on an edge of a knife, N.

The critical material resistance to cutting professor NJ Resnick recommends that determined by the formula:

$$R_{кр} = \delta \cdot \Delta l \cdot \sigma_p\,, \qquad (2)$$

where δ - Thickness (sharpness) blade, m; Δl - active length of the blade m (depending on the layer of the processed material); σr - normal (contact) destructive tensions that arise in the material during cutting, Pa.

According to equations (1) and (2) cutting force depends on the physical and mechanical properties (f, σr) of the processed material, visual and active δ blade length Δl knife directly implements the cutting. Thus, the control force cutting angle setting by selecting the angle α and

sharpening (sharpness of the blade) knife and wide layer of the processed material.

Considering the provisions which set than screw auger surface we found additional resistance to abrasion, cut as food moves along the surface of the blade. Size fNf and fNp will grow from start to finish according bevel knife or surface features. 4. Increase the friction force caused by the constant angle setting knife that will lead to a gradual consolidation of food, and thus to an increase in bulk density feed.

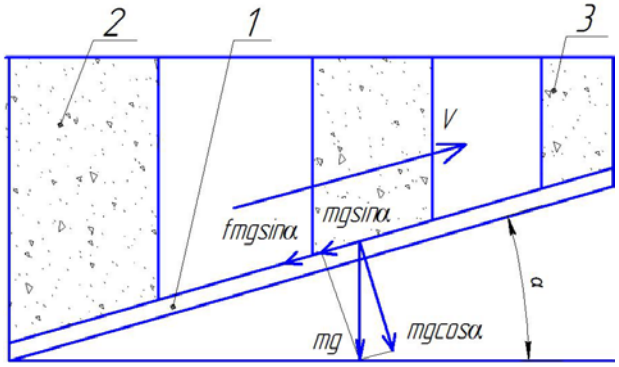

Fig. 4. To determine the resistance when moving feed material for knife: 1 - than 2 - initial density of feed, 3 - the final density of food.

In our case, we define the value of the speed of passage of feed to the surface of the blade.

$$m\frac{dV}{dt} = -mg\sin\alpha - fmg\sin\alpha\,, \tag{3}$$

where f - coefficient of friction, f = tgφ; φ - angle of friction.

$$m\frac{dV}{dt} = -mg\sin\alpha - tg\varphi\cdot mg\sin\alpha\,. \tag{4}$$

Prointehruvavshy equation with initial conditions V = Vo; S = 0 at t = 0, we obtain:

$$V = V_0 - gt\sin\alpha\left(1 + tg\varphi\right). \tag{5}$$

If α> 0, the force moving material increases, and increases the wear surface of the blade.

So, consider when you install the blade parallel to the auger hopper bottoms kormopryhotuvalnoho unit Fig. 5.

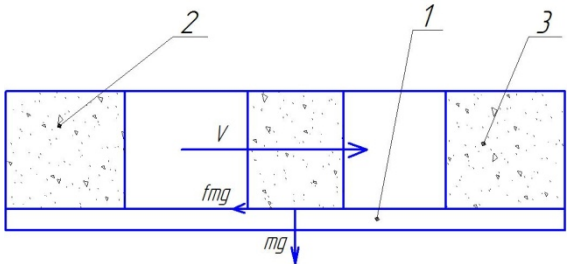

Fig. 5. To justify the installation angle of the knife: 1 - than 2 - initial density of feed, 3 - the final density of food.

At that time,

$$m\frac{dV}{dt} = -fmg\ , \tag{6}$$

$$V = V_0 - fgt\ . \tag{7}$$

Based on traffic conditions, consider the value of effort is applied to move the feed material for knife. In the feed material Fig. 6, which is on the knife, the following forces: gravity - mg, normal reaction plane - N, friction - fN, power, providing material moving - P, the force describing the interaction between a feed components - VZ.

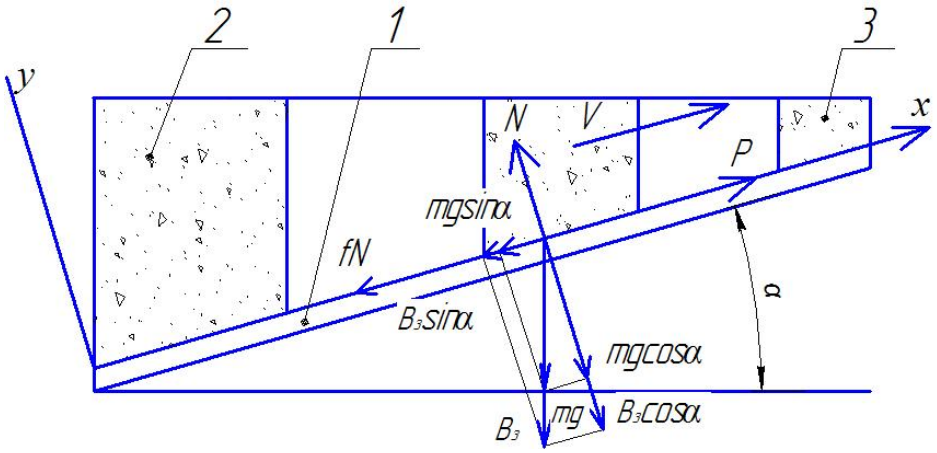

Fig. 6. The forces acting on the knife.

The selected coordinate system Howe. OX axis coincides with the direction of motion. SO axis perpendicular to it. After the expansion of existing in feedstuffs forces on the axes will make the system of equations as follows:

$$\left.\begin{aligned} \Sigma P_x &= P - mg\sin\alpha - B_з\sin\alpha - fN > 0 \\ \Sigma P_y &= N - B_з\cos\alpha - mg\sin\alpha = 0 \end{aligned}\right\}. \tag{8}$$

Find the value of the normal reaction N based on a system of equations and write the equation in the following form:

$$P - mg\sin\alpha - B_з\sin\alpha - fB_з\cos\alpha - fmg\sin\alpha > 0\ . \tag{9}$$

Replacing the friction coefficient f tangent through friction, have $f = \mathrm{Tg}\varphi$. Find the force F, which provides material moving by knife.

$$P = mg\sin\alpha + B_з\sin\alpha + \mathrm{tg}\varphi B_з\cos\alpha + \mathrm{tg}\varphi mg\sin\alpha. \tag{10}$$

Analysis inequality indicates that increasing tilt angle α and the angle φ knife friction force increases P moving feed mixture. If α = 0, the inequality will have a minimum value.

So, put on the auger blades should horizontally (parallel to the bottom of the mixer multi-distributor.

Conclusion. The use of scientifically based design changes in the multi-mixer-distributor lead to the fact that in the preparation of the feed mixture will help reduce energy costs, will increase the quality of treatment and reduce feed cost per unit of livestock.

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In Article conducted analysis work mnohofunktsyonalnoho mixer-razdatchyka, as well as obosnovano ratsyonalnoe Pos workers kotorыe zadeystvovanы bodies in the process pryhotovlenyya kormovыh components for poedanyyu.

Mixer-razdatchyk, kormopryhotvlenye, knife rezanye, эnerhozatratы.

Its paper presents the analysis of multi-functional mixer-distributor and explained efficient installation of working bodies involved in preparation of feed components for feeding.

Mixer-distributor, preparation of feed, knife, cutting, energy costs.

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